GENERAL INDEX TO VOLUME XV.

[NOTE.—Names of Authors and Debaters are printed in SMALL CAPS.; Titles of Papers are in *italic type.*]

PAGE

Air circulation to prevent decay 614
ALDRICH, W. S., *Use of the Indicator for Continuous Records in Dynamometric Testing*, 112; *Power Losses in the Transmission Machinery of Central Stations* 705
ALMOND, T. R., disc., gauge for high-pressure, 1126; steel castings, 273; tests of indicator springs 494
Aluminium bronze, progress in 631
Aluminium for protection of metals 1053
Amendment to Rule 18 ..... 11, 24
Analysis of anthracite coal 50
Anthracite coal for generating steam 36
Ash in anthracite coal 49
Asthon's power meter and continuous indicator 583
ASHWORTH, DANIEL, disc., indicator card of average power, 582; steam-piping 557

BABBITT, GEORGE R., disc., corrosion of steam drums 1096
Babcock, George H., memorial notice of 636
BAKER, C. W., disc., gauge for high-pressure, 1133; steam-piping, 567; steel castings, 274; tests of electric railway plant, 742; theory of shaft governors 956
BALL, FRANK H., *Cylinder Proportions of Compound Engines determined by their Free Expansion Losses*, 759; disc., Buckeye engine valve-gear, 199; effect of water in steam, 447; gauge for high-pressure, 1130; indicator card of average power, 580; influence of compression on water consumption, 926; maximum contemporary economy of steam-engine, 402; theory of shaft governors, 956; water for unjacketed compound engines. 899
Band wheels, strength of 147
BARNABY, C. W., disc., packing of hydraulic machinery, 602; tests of indicator springs 492
BARNES, DAVID L., disc., effect of water in steam 448
BARRACLOUGH, S. H., *Constants for Correcting Indicator Springs that have been calibrated cold* 454
BARR, JOHN H., disc., influence of compression on water consumption 923
BATES, E. P., disc., cost of manufacture 626
Bauschinger, J., memorial notice of 1184
Belting, notes on 204
BENJAMIN, C. H., disc., formula for steel boilers 630
Benzenberg, G. H., on test of Milwaukee pumping engine 432

PAGE

BINSSE, HENRY, disc., first steam-engines in America, 989; relation of drawing office to shop, 978; sand-blasting of files 621
BISSELL, G. W., *Effect of varying the weight of regenerator in a hot-air engine* 744
BORDEN, T. J., disc., first steam-engine in America 995
BRADLEY, J. P., disc., first steam-engine in America 991
BRASHEAR, J. A., disc., new mechanical fluid, 758; theory of shaft governors 960
BRISTOL, W. H., *a new recording pressure gauge for extremely high ranges of pressures* 1119
British Engineers, entertainment of 14
Buckeye valve-gear, A. K. Mansfield 177

Cable plant, losses in 722
Canal waste weir 669
CAPEN, T. W., disc., relation of drawing office to shop 979
CARPENTER, R. C., *constants for correcting indicator springs that have been calibrated cold*, 454; *experimental determination of the effect of water in steam on the economy of the steam-engine*, 438; *new form of Prony brake*, 62; *some experiments on the effect of water hammer*, 510; *the saturation curve as a reference line for indicator diagrams*, 904; disc., indicator card of average power, 583; indicator in dynamometric testing, 125; maximum contemporary economy of steam-engine, 412; disc., regenerator of hot-air engine, 750; simultaneous cards from different indicators 305
CARTWRIGHT, ROBERT, disc., notes on belting 252
CARY, A. A., disc., cost of horse-power, 1152; crucible furnace for petroleum, 309; grates with small openings, 508; gauge for high-pressure, 1124; heat units and specifications for pumping engines, 1117; mechanical draught 1171
CAWLEY, FRANK, disc., compressed air 699
CHENEY, W. L., disc., molecular changes in metals, 616; sand blasting to produce a surface on cast-iron 619
Chimney for water-tube boiler 607
Circulating device for a Scotch boiler 612
Comparison of the mean effective pressures of simultaneous cards taken by different indicators, D. S. Jacobus 277
Compound engines, cylinder proportion 759
Compound steam distribution 1074
Compressed air, note on 685
Compression, effect of, on water consumption 915
Constants for correcting indicator springs that have been calibrated cold, R. C. Carpenter, L. S. Marks, and S. H. Barraclough 454
Continuous indicators 579
COOPER, J. H., disc., circulating device for a Scotch boiler, 612; grouping of tubes in a Scotch boiler, 614; notes on belting, 244; packing for hydraulic machinery 592
Copper, brittleness of 590
Copper for small cores or chills 622
Corrosion of propeller blade 961

PAGE

Corrosion of steam drums, James McBride 1087
Cost of an indicated horse-power, DeCourcy May 1146
Cost of manufacture 623
COXE, ECKLEY B., *technical education*, 655; *the use of small sizes of anthracite coal for generating steam*, 36; disc., amendment to Rule 18, 25; Buckeye engine valve-gear, 199; chimney for water-tube boiler, 610; corrosion of cast-steel propeller blade, 962; cost of horse-power, 1155; mechanical draught, 1177; packing of hydraulic machinery, 599; relation of drawing-office to shop, 980; steam-piping, 547; receives portrait of Francis Reuleaux 32
Craig's circulating device for boilers 618
CRANE, W. E., *Crucible furnace for burning petroleum*, 307; disc., deterioration of copper, 591; packing of hydraulic machinery, 602; sand-blasting for files, 621; sawdust in a non-conducting covering 629
Crucible furnace for burning petroleum, W. E. Crane 307
CRUIKSHANK, BARTON, device for drill jigs 60
Cumulative errors of a graduated scale, W. A. Rogers 127
Curve delineator, A, F. A. Scheffler 67
Cylinder proportions for compound engines determined by their free expansion losses, F. H. Ball 759

Darke indicator 582
DAVIS, E. F. C., disc., corrosion of steam drums 1101
Delineator, A curve 67
DENTON, J. E., *results of measurements of water consumption of an unjacketed 1600 horse-power compound Harris-Corliss engine*, 882; disc., maximum contemporary economy of steam-engine 409
Device for drill jigs, Barton Cruikshank 60
DINGEE, W. W., disc., air circulation to prevent decay 614
DINKEL, GEO., disc., steam-piping 564
Direct-acting steam pumps, theory and results, D. Guelbaum 75
Disinfecting plant, a modern 101
Dodge, Wallace H., memorial notice of 1192
Draught, mechanical 1162
Drawing office and shop 965
Drill jigs, device for 60
Dry rot, prevention of 615
DURFEE, W. F., disc., air circulation to prevent decay, 616; crucible furnace for petroleum, 309; deterioration of copper, 500; first steam-engines in America, 988; hydraulic press to replace drop press, 591; indicator card of average power, 579; packing of hydraulic machinery, 604; steam-piping, 563; steel castings 266, 269, 275
DUTTON, C. S., disc., indicator card of average power 579
Duty of pumping engines 1109
Dynamometric testing, indicator in 112

Earth-work dams 617
Education, technical 655
Effect of varying the weight of regenerator in a hot-air engine, G. W. Bissell. 744
Elasticity of water 532

PAGE
Electric railway plant tests 730
EMERY, C. E., disc., water for unjacketed compound engines, 898; packing hydraulic machinery, 605; cost of horse-power, 1159; corrosion of steam drums 1101
Enamelling for protection of metals 1003
Expansion bearings for bridge superstructures, G. S. Morison 153
Experimental determination of the effect of water in steam on the economy of the steam-engine, R. C. Carpenter 438
Experimental determination of the effect of water in steam on the economy of the steam-engine, L. S. Marks 438
Experiments on water hammer 510

Files, recutting of 620
First stationary steam-engines in America, F. R. Hutton 982
Flach, E. J., memorial notice of 1193
FLATHER, J. J., disc., corrosion cast-steel propeller blade, 963; corrosion of steam drums 1096
Fluid, new mechanical, C. W. Hunt 751
FRANCIS, W. H., *a modern disinfecting plant* 101
FREEMAN, J. R., *a new form of canal waste weir* 669
French Engineers, entertainment of 14
FRITZ, JOHN, disc., steel castings, 273; receives Bessemer medal 13

Galvanizing to protect iron 1040
GANTT, H. L., *recent progress in the manufacture of steel castings* 260
Gauge for high-pressure 1119
Gesner process for protecting iron 1006
GOODELL, JOHN M., disc., earth-work dams 617
Graduated scale, errors of 127
Grashof, Franz, memorial notice of 1183
Grates with small openings 503
GRAVES, ERWIN, disc., packing for hydraulic machinery 593
GRIMM, PAUL H., disc., corrosion of steam drums 1101
GUELBAUM, DAVID, *theory of direct-acting steam pumps and its results* 75

HALE, R. S., disc., theory of steam-jacket 873
HALL, A. F., *heat units and specifications for pumping engines*, 1103; disc., theory of steam-jacket 874
HALSEY, F. A., disc., cost of manufacture, 627; gauge for high-pressure ... 1135
Hardie compressed air motor 696
Harris, John H., memorial notice of 1188
HARTE, C. E., disc., cost of horse-power 1156
HARTNESS, James, disc., Buckeye engine valve-gear 200
Haswell process for protecting iron 1037
HAWKINS, J. T., disc., corrosion of steam drums, 1099; japanning to protect steel from corrosion 619
Heat uni's and specifications for pumping engines, A. F. Hall 1103
HEGGEM, C. O., disc., compressed air 696
HENNING, G. C., disc., corrosion of propeller blade, 962; crucible furnace for petroleum, 309; deterioration of copper, 590; expansion bearings

PAGE

for bridges, 169 ; gauge for high-pressure, 1121 ; rustless coating, 1063; tests of indicator springs 488
Hick's tests of friction of packing 494
HOLLOWAY, J. F., disc., Buckeye engine valve-gear, 198 ; corrosion of steam drums, 1096 ; cost of horse-power, 1155 ; gauge for high-pressure, 1122 ; rustless coating, 1063; sand-blasting for old files 620
Horse-power, cost of 1146
Hot-air engine, regenerator in 744
HUNT, C. W., *a new mechanical fluid* 751
HUTTON, F. R., *memorial notice Geo. H. Babcock*, 636 ; *first stationary steam-engines in America*, 982; disc., amendment to Rule 18, 24 ; heat units and specifications for pumping engines, 1112; on corrosion cast-steel propeller blade 963
Hydraulic machinery, packing for 592
Hydraulic press to replace drop press 591

Indicator in dynamometric testing 112
Indicators calibrated in the cold 454
Indicators, comparison of 277

JACOBUS, D. S., *a comparison of the mean effective pressures of simultaneous cards taken by different indicators*, 277 ; *results of measurements of the water consumption of an unjacketed* 1600 *horse-power compound Harris-Corliss engine*, 882 ; *results of experiments with a fifty horse-power single non-condensing Ball and Wood engine to determine the influence of compression on the water consumption*, 915 ; disc., compressed air, 696 ; cylinder proportions compound engines, 776 ; effect of water in steam, 447 ; improved planimeter, 635 ; theory of direct-acting pumps, 98 ; theory of shaft governors 950
Japanning to protect steel from corrosion 619
Jigs, device for 60

KENT, WILLIAM, disc., Buckeye engine valve-gear, 199; formula for steel boilers, 629 ; grate with small openings, 508 ; hydraulic press to replace drop press, 591 ; indicator card of average power, 578 ; maximum contemporary economy of steam-engine, 402 ; notes on belting, 242 ; packing of hydraulic machinery, 602 ; steam-piping 242
KING, FRANK B., *notes on the corrosion of a cast-steel propeller blade* 961

Lacquer for protection of metals 1058
LAFORGE, F. H., disc., gauge for high-pressure 1124
Lanphear, O. A., memorial notice of .....
LANZA, GAETANO, disc., theory of shaft governor 949
LEVAN, W. B., disc., chimney for water-tube boiler, 608 ; effect of water in steam, 447 ; formula for steel boilers, 631 ; first steam-engines in America, 995 ; grates with small openings, 508 ; modern disinfecting plant, 109 ; molecular changes in metals, 617 ; sand-blasting of old files, 620 ; steam-piping 546
LEWIS WILFRED, disc., notes on belting 252
Losses in transmission 705

PAGE
Low, F. R., disc., indicator card of average power 582
Lubricator for cylinder at high-pressure..... 610

Manning, Chas. H., *a method of manufacture of large steam pipes*..... 571
Mansfield, A. K., *the Buckeye valve-gear*, 177; *notes on theory of shaft governors*..... 929
Marks, L. S., *constants for correcting indicator springs that have been calibrated cold*, 454; *experimental determination of the effect of water in steam on the economy of the steam-engine* 438
Mattes, W. F., disc., cylinder lubricator, 610; sawdust in non-conducting covering..... 629
Maximum contemporary economy of the high-pressure multiple-expansion steam-engine, R. H. Thurston..... 313
May, DeCourcy, *cost of an indicated horse-power* 1146
McBride, James, *corrosion of steam drums*, 1087; disc., gauge for high-pressure..... 1131
McMillan, Thos., on test of Milwaukee pumping engine..... 432
Mechanical draught, W. R. Roney..... 1162
Method of manufacture of large steam-pipes, C. H. Manning 571
Modern disinfecting plant, W. H. Francis 101
Molecular changes in metals..... 616
Morison, George S., *expansion bearings for bridge superstructures*..... 153
Multiple-expansion steam-engine efficiency 313

Nason, C. W., disc., corrosion of steam drums, 1097; experiments on water hammer, 531; rustless coating 1064
New form of canal waste weir, John R. Freeman..... 669
New form of Prony brake, R. C. Carpenter..... 62
New method of compound steam distribution, F. M. Rites..... 1074
New recording pressure gauge for extremely high ranges of pressures, W. H. Bristol..... 1119
Note on compressed air, Frank Richards..... 685
Notes on belting, F. W. Taylor..... 204
Notes on the corrosion of a cast-steel propeller blade..... 961
Notes on the theory of shaft governors, A. K. Mansfield..... 929

Packing for hydraulic machinery..... 592
Patton, W. H., memorial notice of..... 1194
Peabody, C. H., disc., maximum contemporary economy of steam-engine.. 392
Pearson, W. A., disc., steel castings, 271; steam-piping..... 551
Petroleum, crucible furnace 307
Pike, William A., *steam-piping and efficiency of steam plants*..... 536
Pipes, manufacture of large..... 571
Piping of steam plants..... 536
Planimeter, improvement in..... 635
Platt, J. C., disc., indicator card of average power..... 577
Platt, John, disc., steel castings 270
Porter, Charles T., disc., tests of indicator springs..... 490
Power losses in the transmission machinery of central stations, W. S. Aldrich..... 705

PAGE

President's address for 1893, E. B. Coxe 36
Proceedings, Montreal Meeting, 1894 643
Proceedings, New York Meeting, 1893 3
Prony brake, new form of 62
Pumping engine specifications 1103
Punched steel plates, tests of 630

Randolph, L. S., disc., corrosion of steel drums, 1100; relation of drawing-office to shop 976
Raynal, A. H., disc, circulating device for a Scotch boiler, 613; packing of hydraulic machinery 603
Recent progress in the manufacture of steel castings, H. L. Gantt 260
Relation of drawing-office to the shop, A. W. Robinson 965
Results of measurements of the water consumption of an unjacketed 1600 *horse-power compound Harris-Corliss engine*, Denton, Jacobus, Rice 882
Results of experiments with a fifty horse-power single non-condensing Ball and Wood engine to determine the influence of compression on the water consumption, D. S. Jacobus 915
Rice, R. H., *results of measurements of the water consumption of an unjacketed* 1600 *horse-power compound Harris-Corliss engine* 882
Richmond, George, disc., indicator card of average power 583
Richards, F. H., disc., copper for small cores or chills 622
Richards, Frank, *a note on compressed air*, 685; disc., steam-piping 566
Rim-joints, strength of 147
Rites, F. M., *a new method of compound steam distribution*, 1074; disc., theory of shaft governors 958
Rivet holes in steel, effect of 629
Riveted pipe 571
Robinson, A. W., *the relation of the drawing-office to the shop in manufacturing* 965
Rockwood, G. I., disc., Buckeye engine valve-gear, 198; compound steam distribution, 1082; indicator card of average power, 578; maximum contemporary economy of steam-engine, 695; mechanical draught, 1178; mechanical fluid, 757; simultaneous cards from different indicators, 306; theory of steam-jacket, 875; tests of indicator springs, 490; water for unjacketed compound engines 897
Rogers, W. A., *the cumulative errors of a graduated scale* 127
Rogers, W. S., disc., Buckeye engine valve-gear, 200; new mechanical fluid, 757; notes on belting 247
Roelker, H. B., disc., cast-steel propeller, 962; formula for steel boilers .. 631
Roney, W. R., *mechanical draught* 1163
Rourke, John, letter on Savannah engine 995
Rowland, T. F., presents model Ericsson monitor 9
Royce, H. A., disc., steel castings 273
Rustless coatings for iron and steel, M. P. Wood 998

Sand-blasting of old files 620
Sand-blasting to produce a surface on cast-iron 619
Saturation curve as reference line for indicator diagram, R. C. Carpenter .. 904
Sawdust and plaster of Paris as a non-conductor 628

PAGE

SCHEFFLER, F. A., *a curve delineator*, 67; disc., effect of water in steam, 449; maximum contemporary economy of steam-engine, 401; test of a boiler using grates with small percentage of openings 503
SCHEFFLER, T. F., disc., chimney for water-tube boiler 607
Selden, George, memorial notice of 1191
Shaft governors, theory of 929
SHAW, A. J., disc., relation of drawing-office to shop 979
SINCLAIR, G. M., disc., steam-piping 555
Sizes of anthracite coal 41
Slate in anthracite coal 42
Small sizes of coal for generating steam, E. B. Coxe 36
SMITH, JESSE M., *tests of a small electric railway plant* 730
SMITH, OBERLIN, disc., steam-piping 546
Some experiments on the effect of water hammer, R. C. Carpenter 510
Standard diameters of flanges, Committee discharged 26
Standard method of test of efficiency of locomotives, Committee discharged. 26
Standard thickness gauge, Committee report 27
STANWOOD, J. B., *strength of rim-joints in fly band wheels* 147
Steam-jacket 779
Steam-piping and efficiency of steam plants, William A. Pike 536
Steam pumps, theory and results 75
Steel boiler plate, formula for 629
Steel castings, recent progress in 260
STETSON, G. R., disc., gauge for high-pressure 1136
Storey's continuous indicator 583
Strength of rim-joints in fly band wheels, J. B. Stanwood 147
SUPLEE, H. H., presents portrait of Joseph Harrison, 9; presents portrait of Francis Reuleaux 29
SWEET, JOHN E., disc., theory of direct-acting pumps 97

TAYLOR, FRED. W., *notes on belting*, 204; disc., steel castings 268
Technical education, E. B. Coxe 655
Test of a boiler using grates with small percentage of openings, F. A. Scheffler 503
Tests of friction of packing 594
Tests of indicators in the cold 454
Tests of a small electric railway plant, Jesse M. Smith 730
Theory of direct-acting steam pumps, and its results, David Guelbaum 75
Theory of the steam-jacket, current practice, R. H. Thurston 779
THURSTON, R. H., *on the maximum contemporary economy of the high-pressure multiple-expansion steam-engine*, 313; *theory of the steam-jacket, current practice*, 779; disc., effect of water in steam, 449; disc., steam-piping, 560; presents portrait of Francis Reuleaux 30
Tinning for protection of metals 1003
Topical discussions, New York Meeting, 1893 577
TORREY, H. G., disc., crucible furnace for petroleum 310
TOWNE, HENRY R., disc., notes on belting 238
Transmission losses 705
Travelling cranes, speeds 612
Tube grouping in Scotch boilers 614
Turbine efficiency 717

PAGE

Use of the indicator for continuous records in dynamometric testing, W. S. Aldrich 112

Use of small sizes of anthracite coal for generating steam, E. B. Coxe 36

Valve-gear of Buckeye engine, A. K. Mansfield 177
Veeder, J. I., memorial notice of 1190

Wall, E. B., memorial notice of 1196
WALDO, LEONARD, disc., progress in aluminium bronzes 631
Walton, T. H., letter on Savannah engine 997
WALWORTH, A. C., disc., steam-piping 544
Waste weir, new form of 669
Water hammer, effect of 510
Water in steam-pipe, effect of 560
Water in steam, effect of 438
Wear of dies 591
Weaver, S. B., memorial notice of 1189
WEBB, J. B., disc., gauge for high-pressure, 1132; indicator card of average power, 578; theory of shaft governors 956
WEBBER, SAMUEL, disc., cost of horse-power, 1151; chimney for water-tube boiler, 608; cylinder lubricator, 612; speeds for travelling cranes 612
Wilcox, Stephen, memorial notice of 1188
WOOD, M. P., *rustless coatings for iron and steel* 998
WOOD, DEVOLSON, disc., experiments on water hammer 529
WOODBURY, C. J. H., disc., air circulation to prevent decay, 615; sawdust in a non-conducting covering 629
WOOLSON, O. C., disc., crucible furnace for petroleum, 310; first steam-engines in America, 992; modern disinfecting plant 109
WRIGHT, LOUIS S., disc., cost of manufacture, 623; relation of drawing-office to shop, 976; water for unjacketed compound engines 897